



Pre-Leaving Certificate Examination 2026

Mathematics

(Option B)

Paper 2

Higher Level

2 hours 30 mins

300 marks

Name:
School:
Address:
Class:
Teacher:

For examiner	
Question	Mark
1	
2	
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8	
9	
10	
Total	

Running total	
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Grade

Instructions

There are **two** sections in this examination paper.

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	4 questions

Answer questions as follows:

- **any five** questions from Section A – Concepts and Skills
- **any three** questions from Section B – Contexts and Applications

Write your answers in blue or black pen. You may use pencil in graphs and diagrams only.

Anything that you write outside of the answer areas may not be seen by the examiner.

Write all answers into this booklet. There is space for extra work at the back of the booklet.

If you need to use it, label any extra work clearly with the question number and part.

The superintendent may give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination.

In general, diagrams are not to scale.

You will lose marks if your solutions do not include relevant supporting work.

You may lose marks if the appropriate units of measurement are not included, where relevant.

You may lose marks if your answers are not given in simplest form, where relevant.

Write the make and model of your calculator(s) here:

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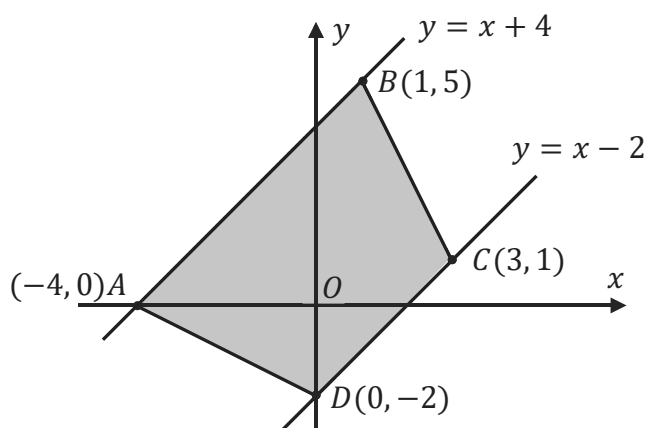
Answer **any five questions** from this section.

Question 1**(30 marks)**

The points $A(-4, 0)$ and $B(1, 5)$ lie on the line $y = x + 4$.

The points $C(3, 1)$ and $D(0, -2)$ lie on the line $y = x - 2$.

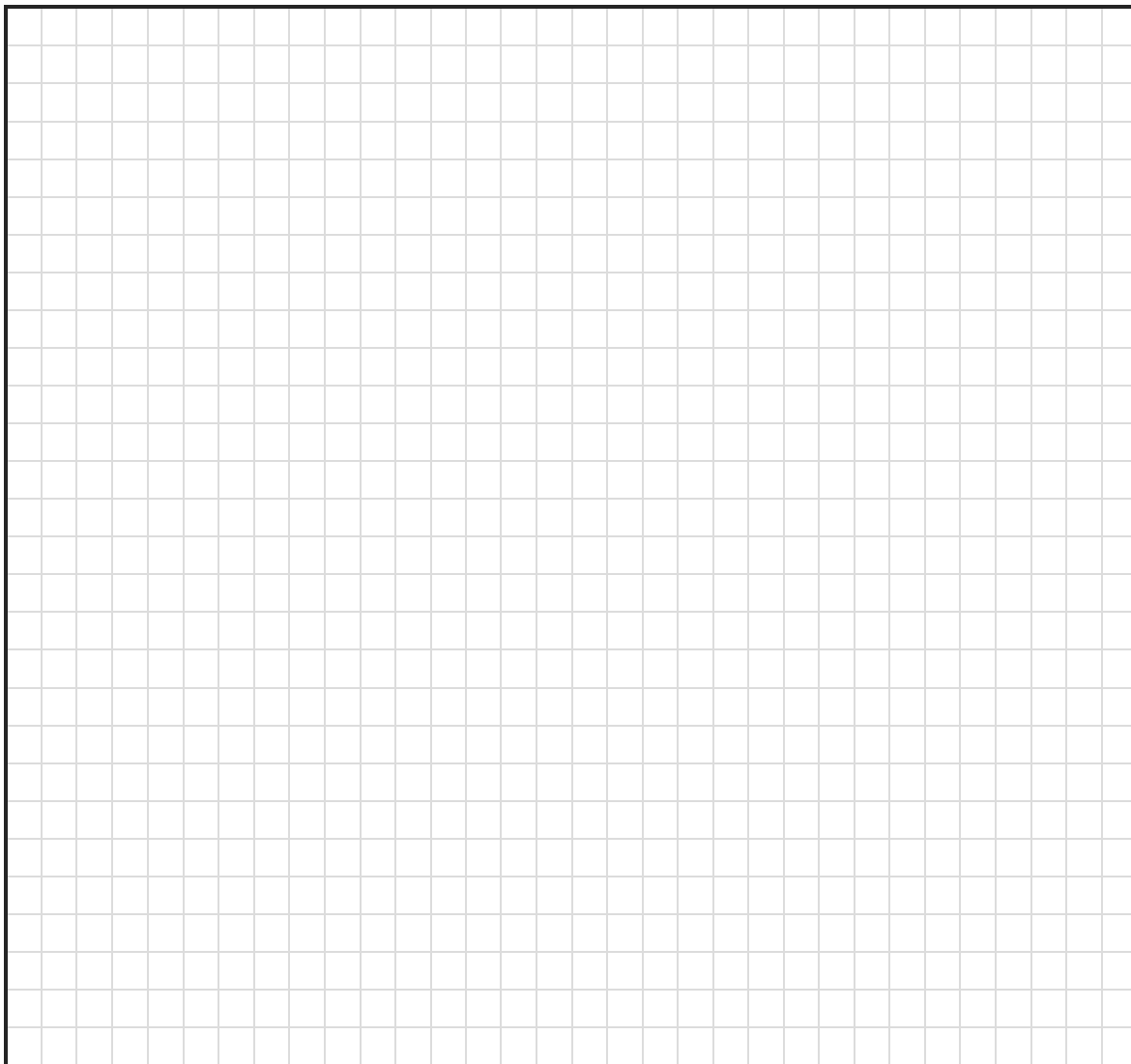
The points A, B, C, D form a trapezium as shown.



- (a) Find the **exact** distance $|AB|$.

- (b) Find the **exact** perpendicular distance from point $A(-4, 0)$ to the line $y = x - 2$.

- (c) Calculate the area of the trapezium $ABCD$.



(30 marks)

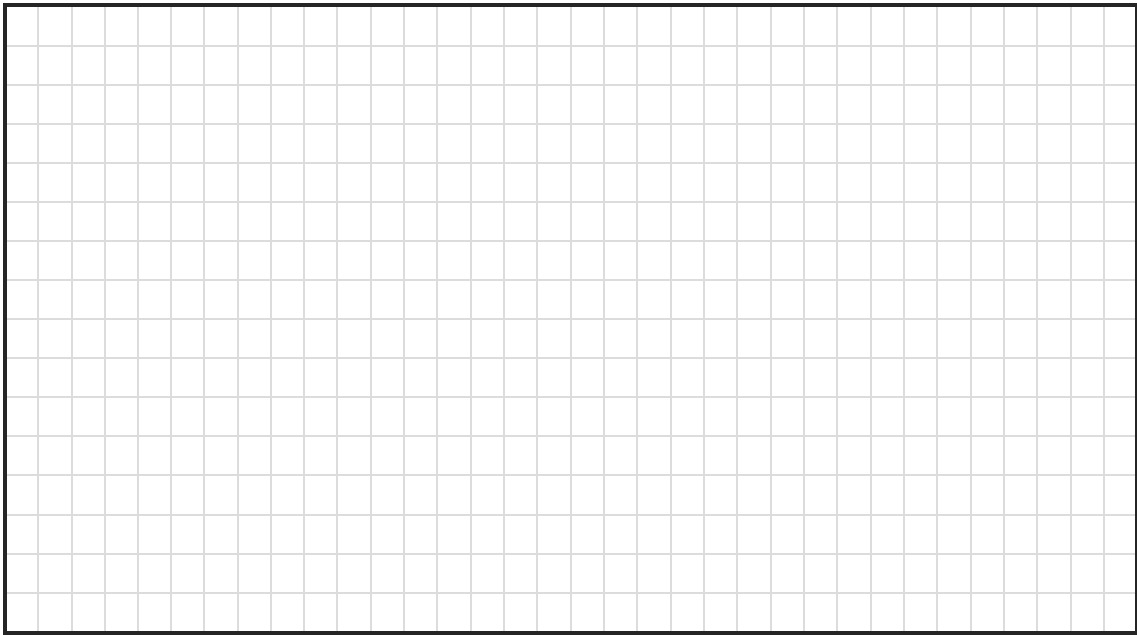
The circle s has equation $x^2 + y^2 - 8x - 12y + 48 = 0$.

- | | | | | | | | |
|--------------|--|--------------|--|--------------|--|--------------|--|
| Centre $c =$ | | Radius $c =$ | | Centre $s =$ | | Radius $s =$ | |
| | | | | | | | |

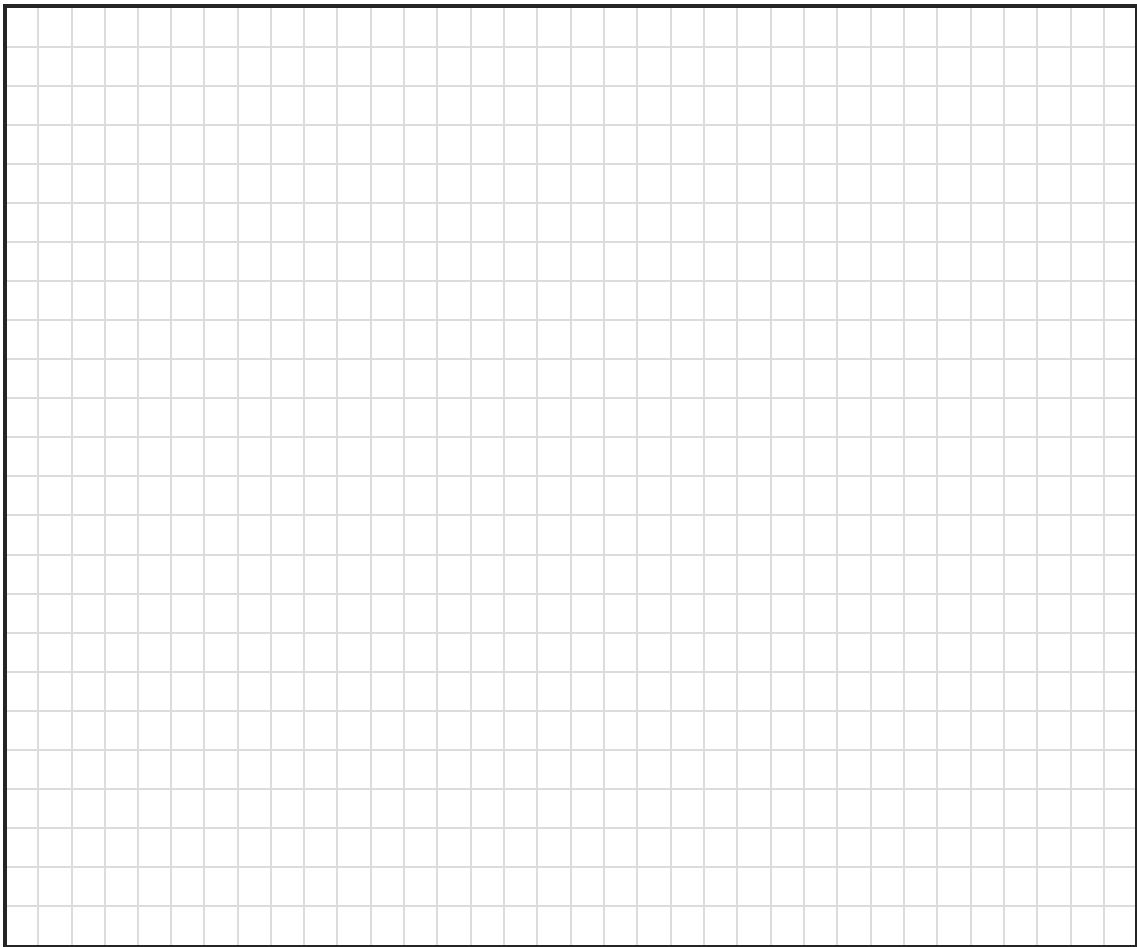
- [illegible]

(c) The point $A(5,2)$ is a point on the circle $x^2 + y^2 + kx - 2y + 5 = 0$.

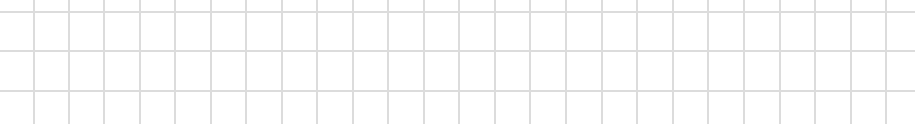
(i) Show that k is -6 .



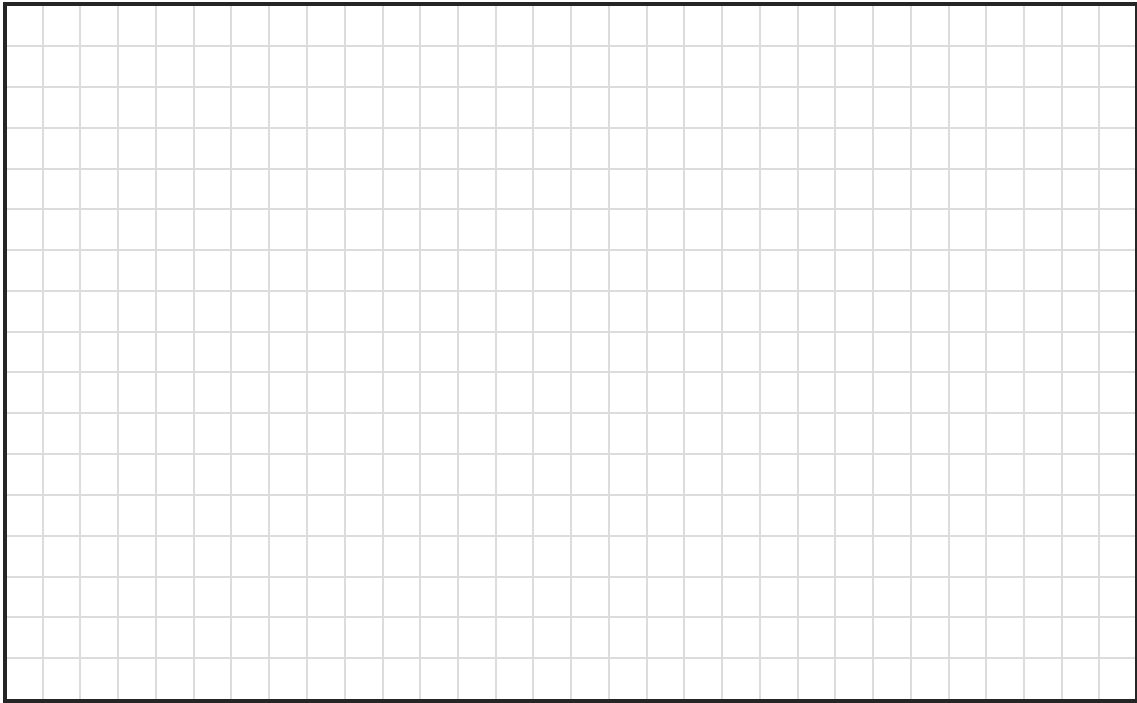
(ii) Hence, find the intersection of the circle and the line $x - y - 1 = 0$.



(30 marks)

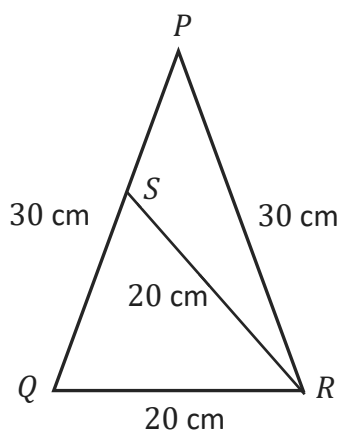
[illegible]

- (d) What is the probability that the fourth even number occurs on the seventh spin?
Give your answer as a decimal, correct to 4 decimal places.

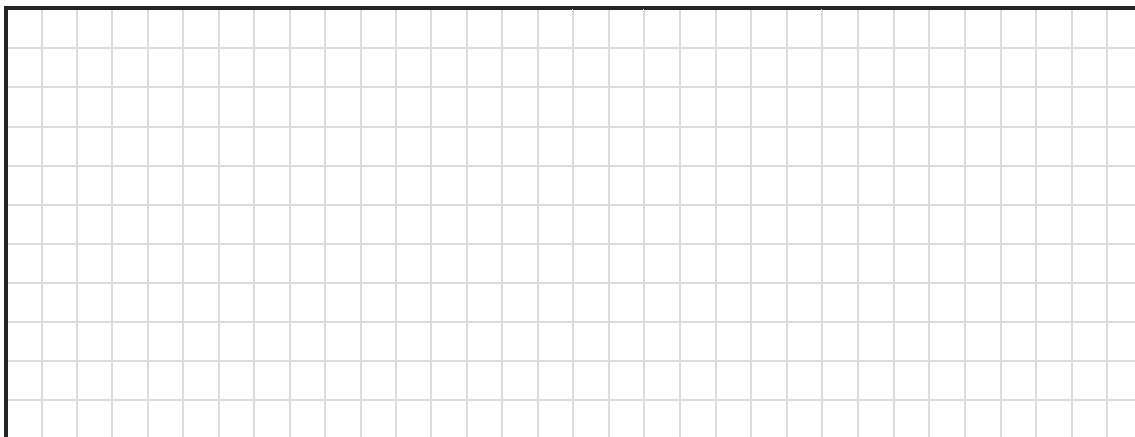


Question 4**(30 marks)**

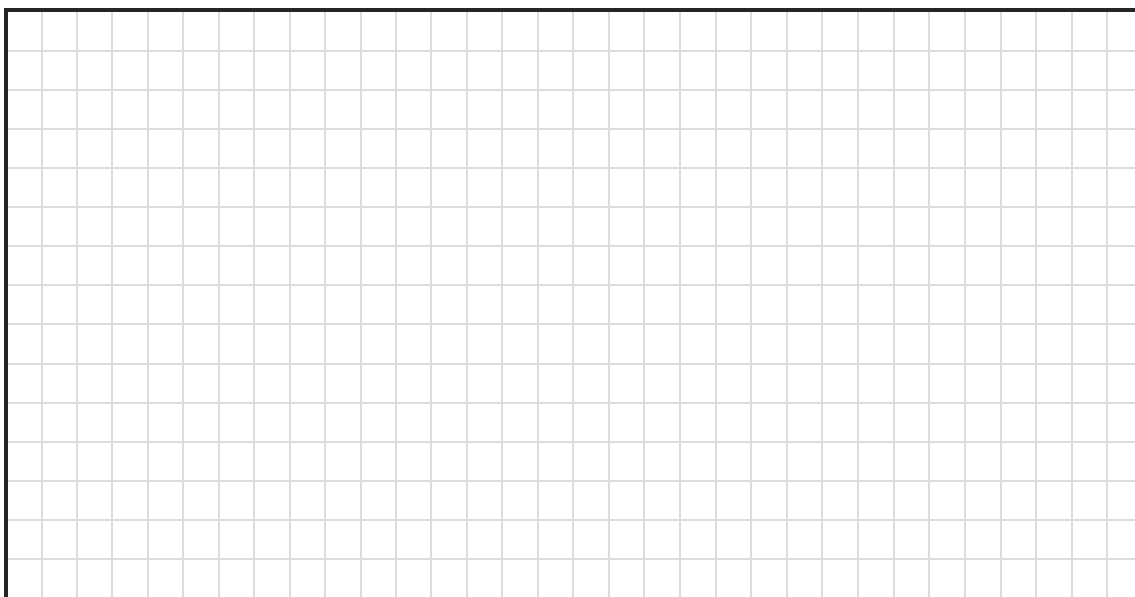
- (a) In $\triangle PQR$, sides PQ and PR have length 30 cm, and QR has length 20 cm. The point S is chosen on PQ so that SR has length 20 cm.



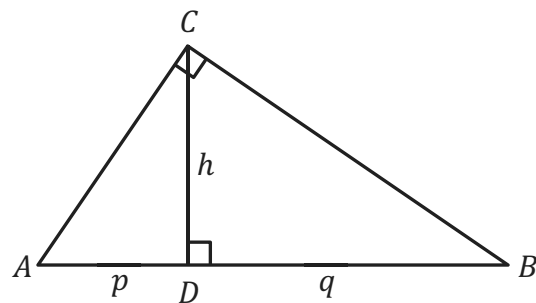
- (i) Prove that $\triangle PQR$ and $\triangle RSQ$ are similar.



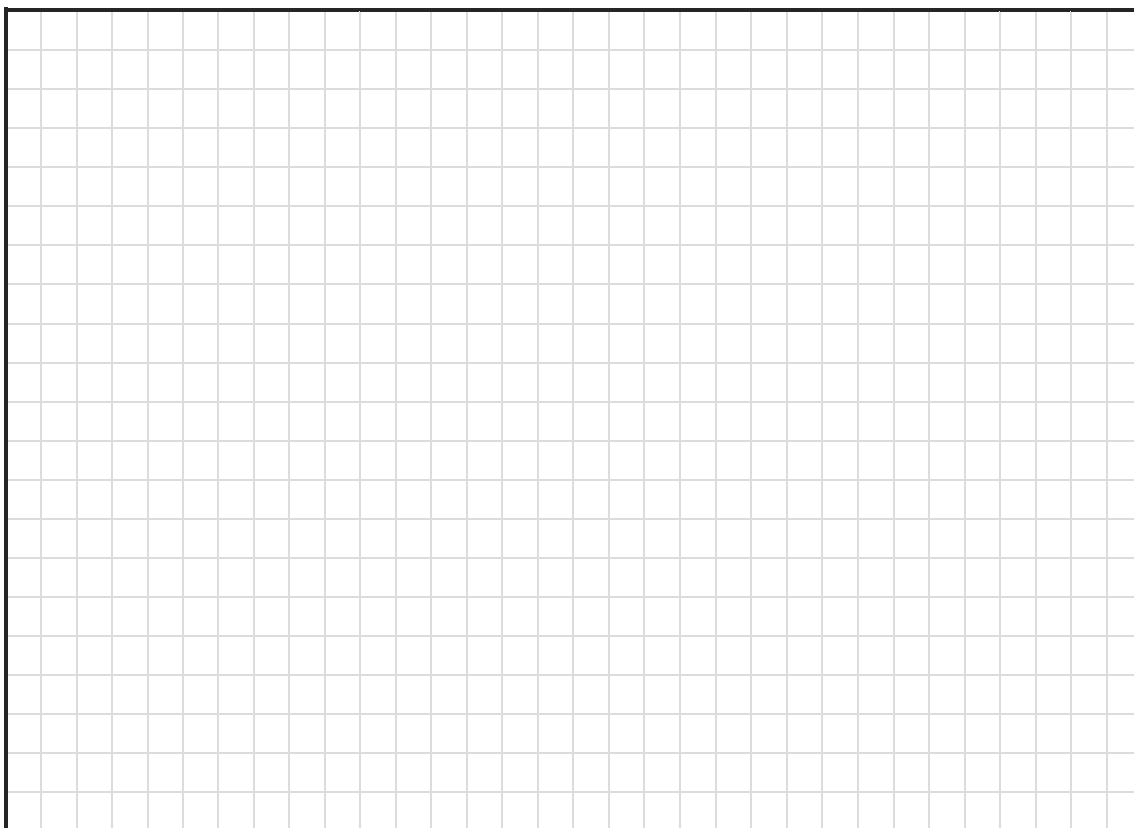
- (ii) Find $|PS|$. Give your answer in cm, correct to 2 decimal places.



- (b) The triangle ABC is a right-angled triangle with the right angle at C . The point D is chosen on AB so that CD is perpendicular to AB as shown in the diagram below.



The length of AD is p , the length of BD is q and the length of CD is h .
Show that $h = \sqrt{pq}$.

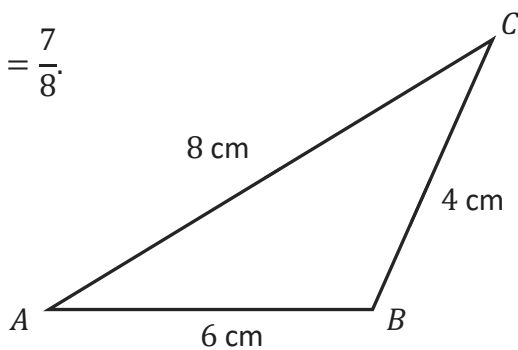
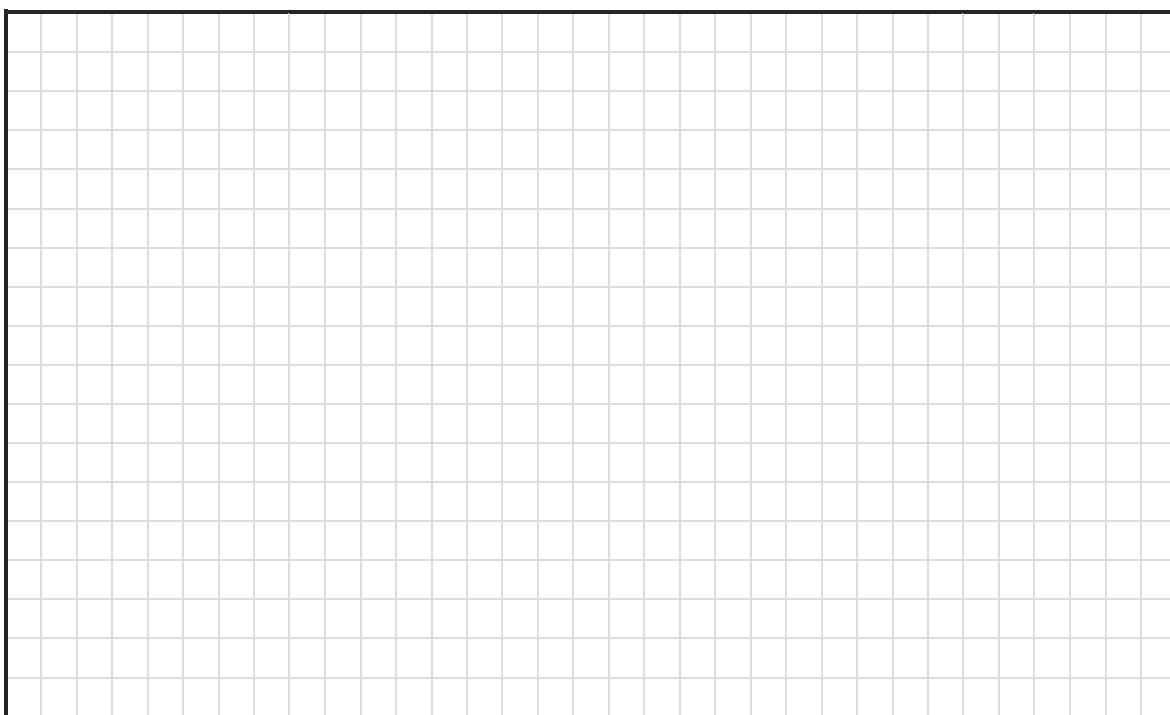


Question 5

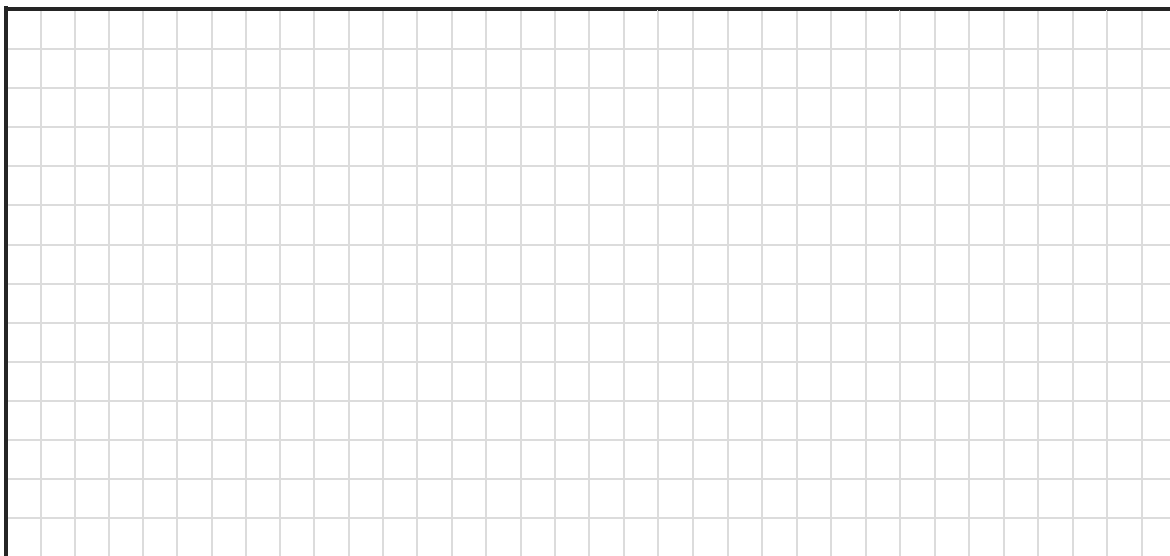
(30 marks)

(a) The diagram shows $\triangle ABC$ with sides $|AB| = 6$ cm, $|BC| = 4$ cm and $|AC| = 8$ cm.

(i) Show that $\cos A = \frac{7}{8}$.



(ii) By finding the **exact** value of $\sin A$, determine the **exact** area of $\triangle ABC$, in cm^2 .



- (b) Find all **four** solutions to the following equation in θ , where $0 \leq \theta \leq 360^\circ$:

$$\cos 2\theta = -\frac{1}{2}$$



Question 6

(30 marks)

A bag contains the following cardboard shapes:

10 red squares, 15 blue squares, 8 red triangles and 12 blue triangles.

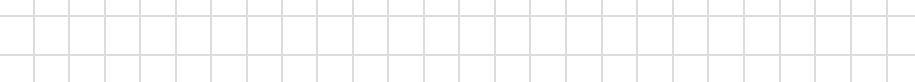
One of the shapes is drawn at random from the bag.

A is the event that a square is drawn.

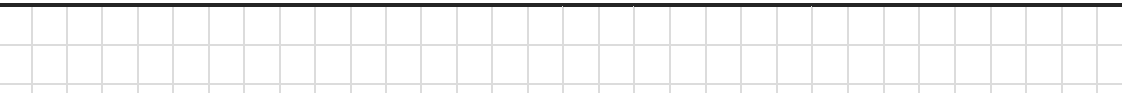
B is the event that a blue shape is drawn.



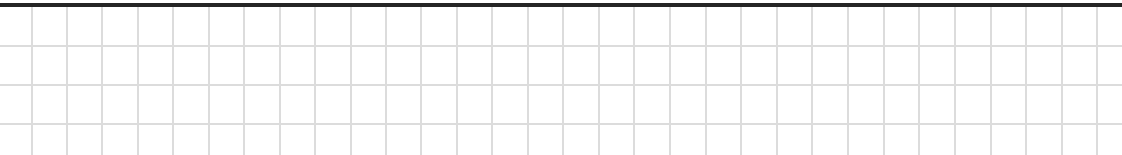
- (a)** Find $P(A \cap B)$. Give your answer as a fraction, in its simplest form.



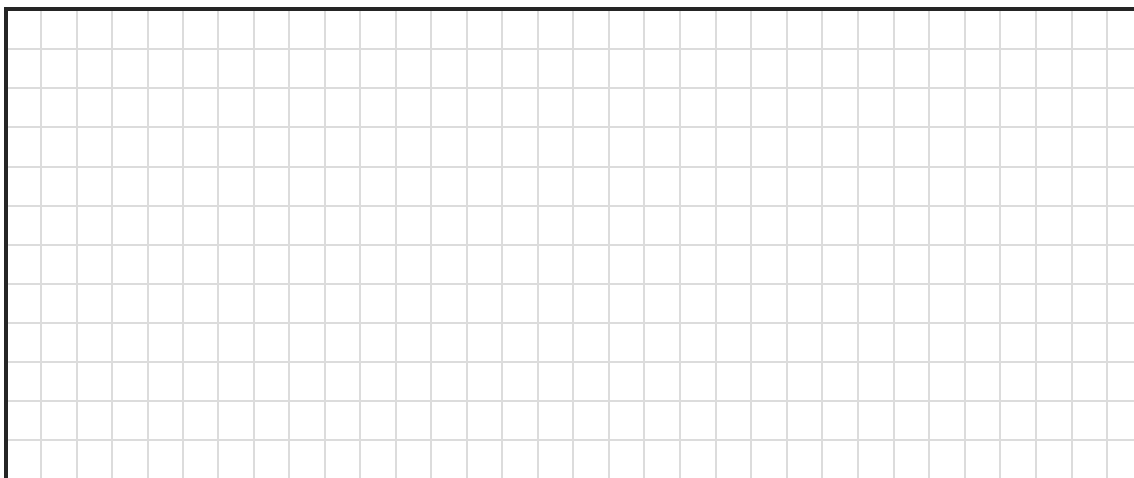
- (b)** Find $P(A \cup B)$. Give your answer as a fraction, in its simplest form.



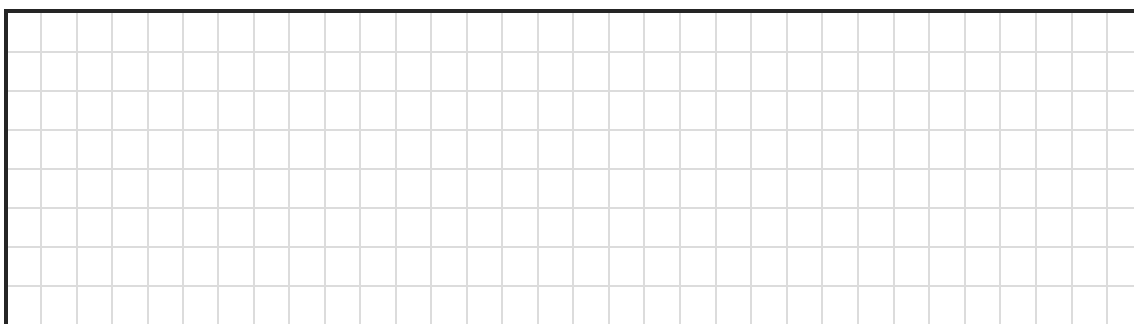
- (c)** Find $P(B|A)$. Give your answer as a fraction, in its simplest form.



- (d) State whether A and B are independent events. Justify your answer.

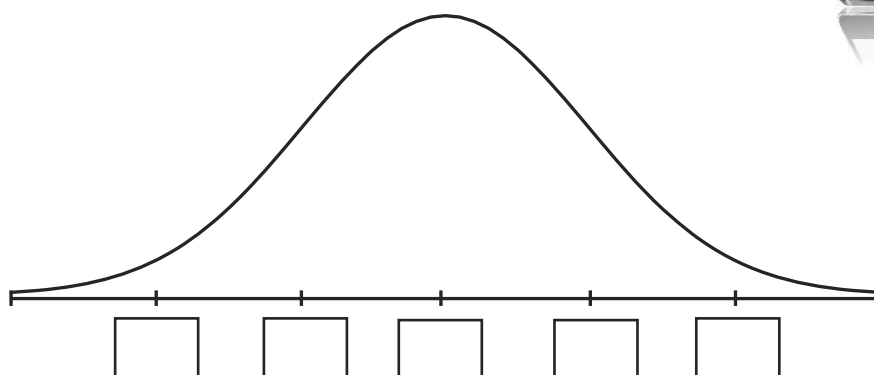


- (e) State whether A and B are mutually exclusive events. Justify your answer.

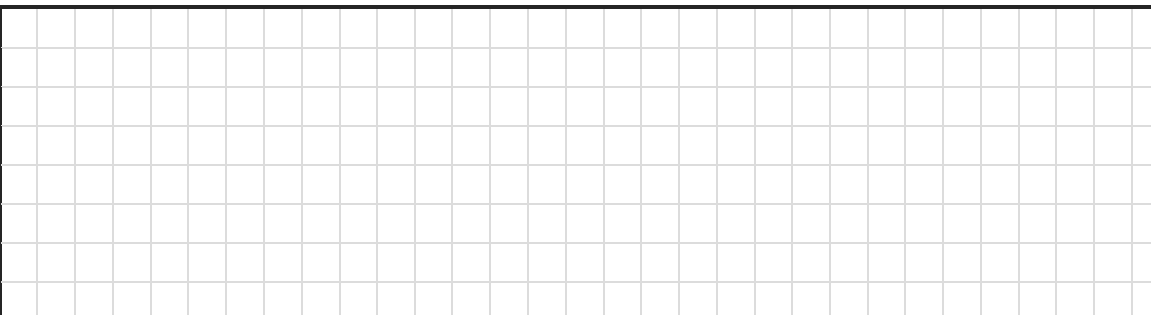


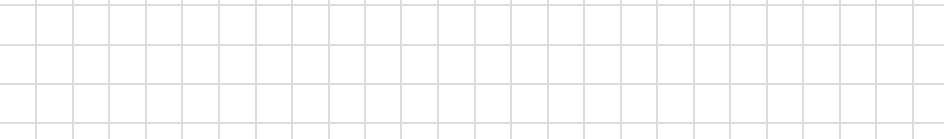
Question 7

(a) Testing has been carried out on the length of time (t hours) that a new Brand X smartphone battery will work before the phone switches off because it needs charging. A large number of Brand X phone batteries were tested and t was found to be normally distributed with a mean life of 16.3 hours and a standard deviation of 2.4 hours. All batteries were fully charged before being tested.



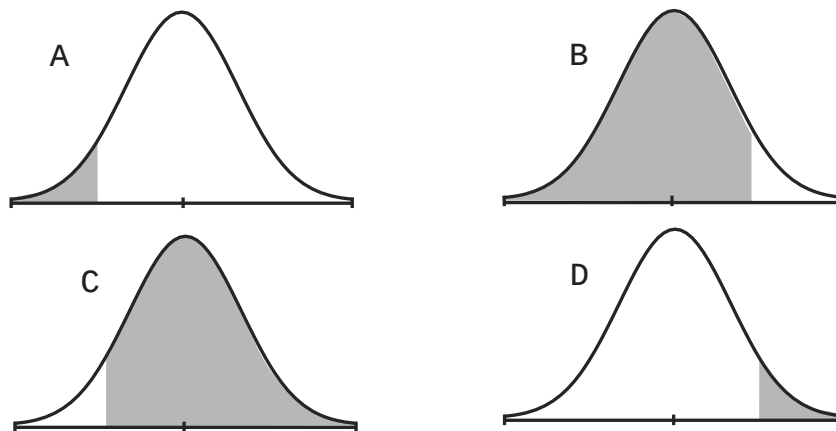
(i) The graph above represents the normal distribution for Brand X smartphone batteries. **Write** a number in each box to provide a partial scale for the distribution.

[illegible]

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- Brand X advertisers claim that 90% of their smartphone batteries will last at least t hours.

- (i) Circle the letter of the graph below that represents this claim.**



- (ii) Calculate the value of t . Give your answer correct to 2 decimal places.

[illegible]

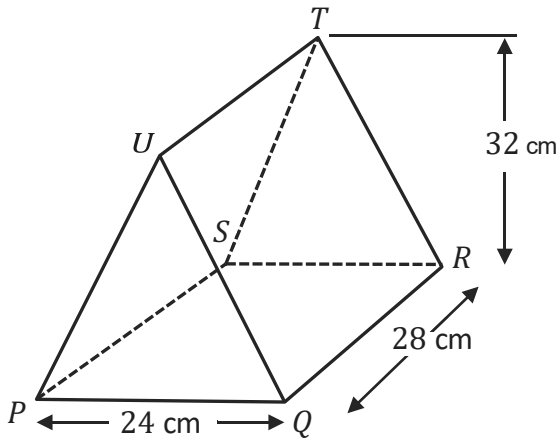
This question continues on the next page.

Question 8

(50 marks)

Patricia is a student in a woodwork class.
The class will construct geometrical solids from a block of wood.

- (a) Patricia carves a regular triangular prism $PQRTU$ from her block of wood, as shown in the diagram below.
The point T is halfway between S and R .



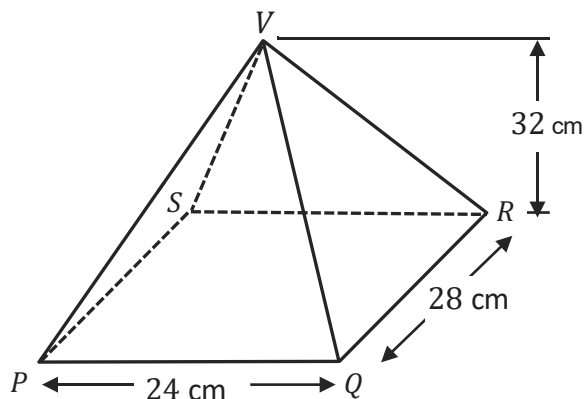
- (i) Find the exact value of $|RT|$, in centimetres.

$|RT| =$

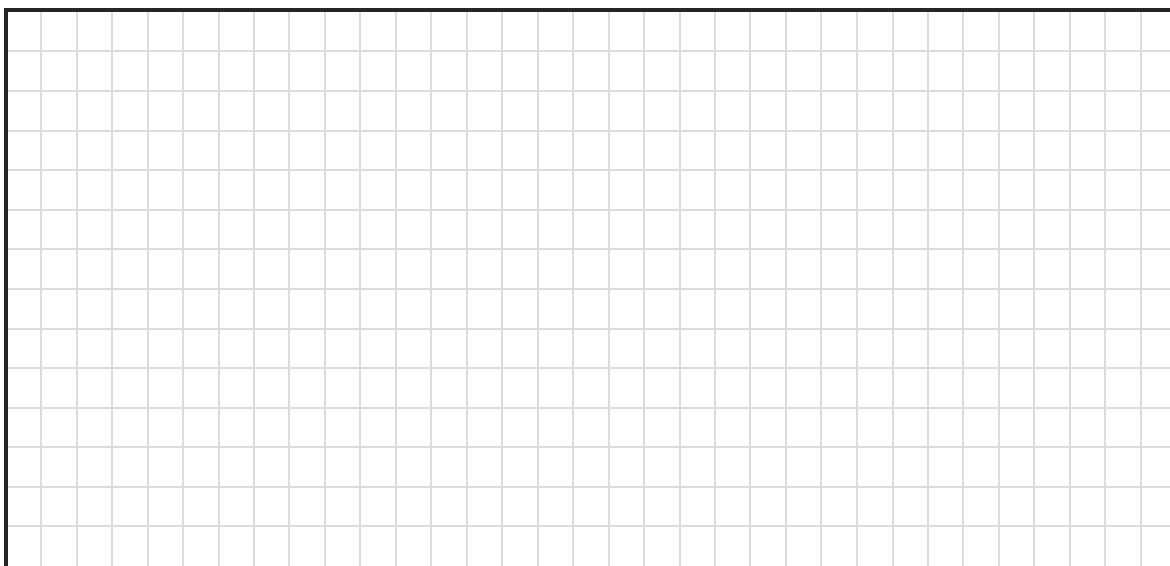
- (ii) Find the total surface area (including the base), of the prism, in cm^2 .
Give your answer correct to 2 decimal places.

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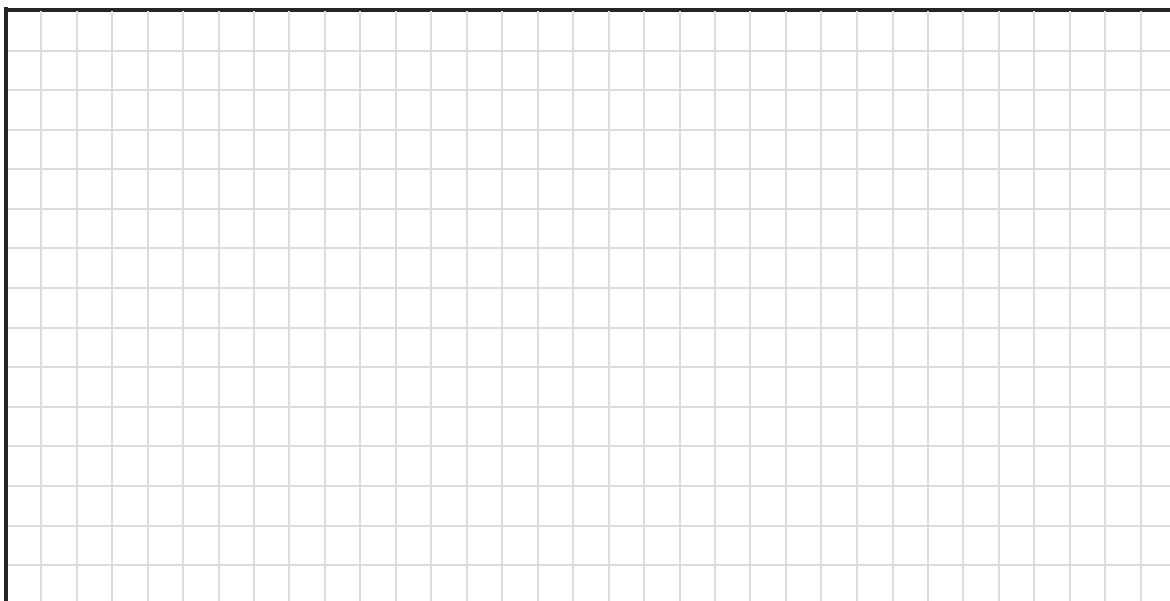
- (b) Patricia's next project is to carve the right rectangular pyramid $PQRSV$, as shown in the diagram below.



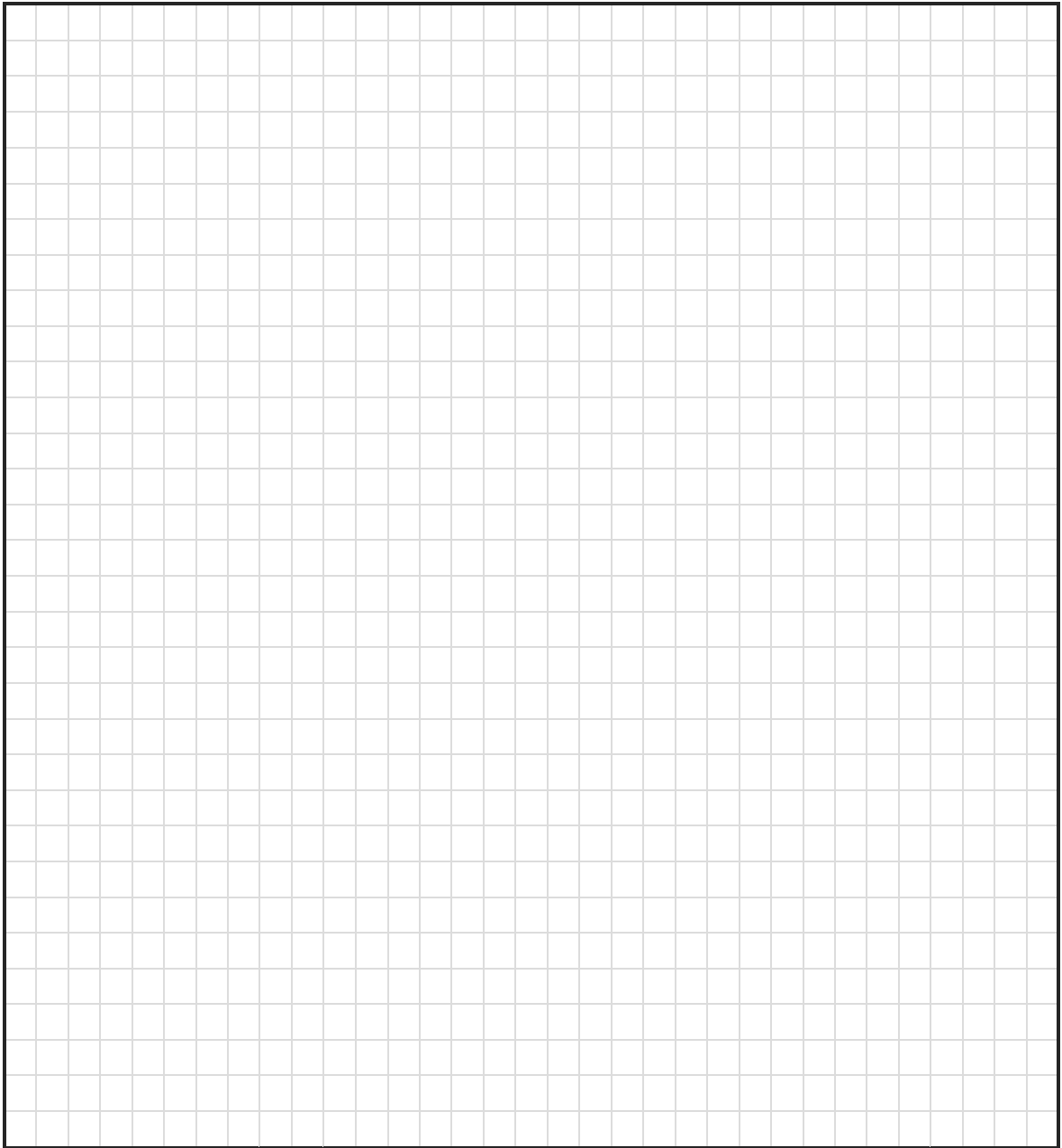
- (i) Find the total volume of the pyramid, in cm^3 .



- (ii) Find the length of the edge $|PV|$, in centimetres.
Give your answer in the form $a\sqrt{b}$, where $a, b \in \mathbb{R}$.



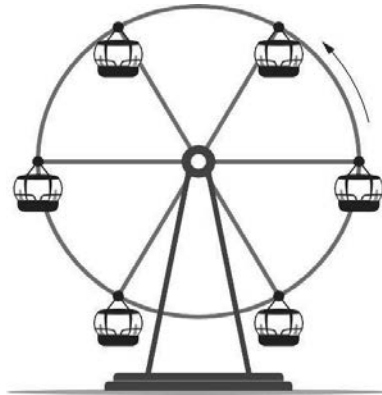
- (iii) Find the total surface area (including the base) of the pyramid, in cm^2 .
Give your answer correct to 2 decimal places.



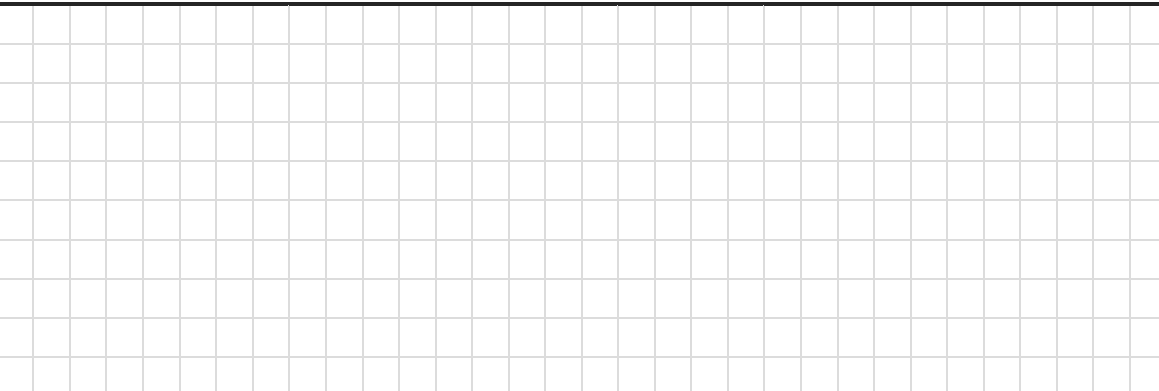
(50 marks)

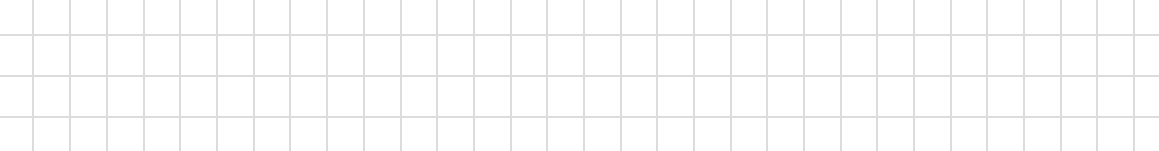
- $$h(t) = a - b \cos\left(\frac{\pi}{24}t\right)$$

and $\left(\frac{\pi}{24}t\right)$ is in **radians**.



(i) Show that $a = 21$ and $b = 18$.

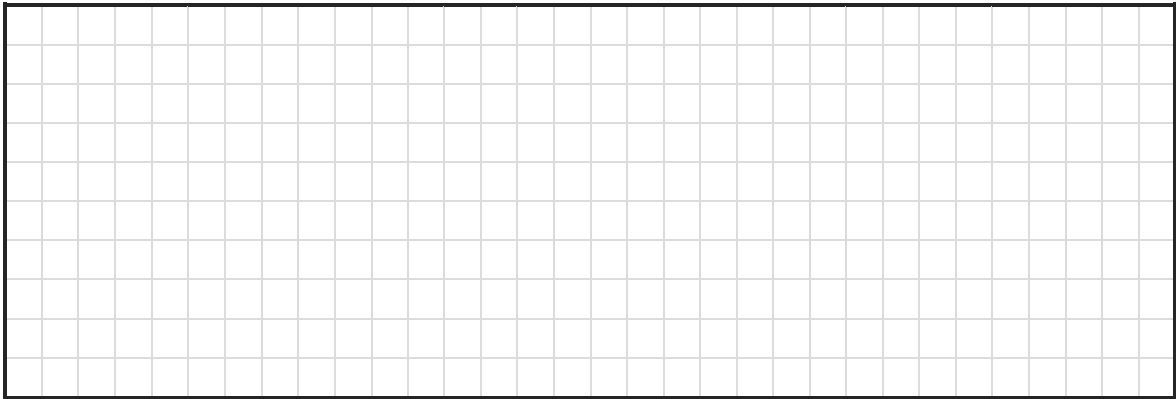
A large grid of graph paper, consisting of 20 columns and 10 rows of squares, intended for drawing a picture.

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- A large grid of graph paper, consisting of 20 columns and 10 rows of squares, intended for drawing a picture.

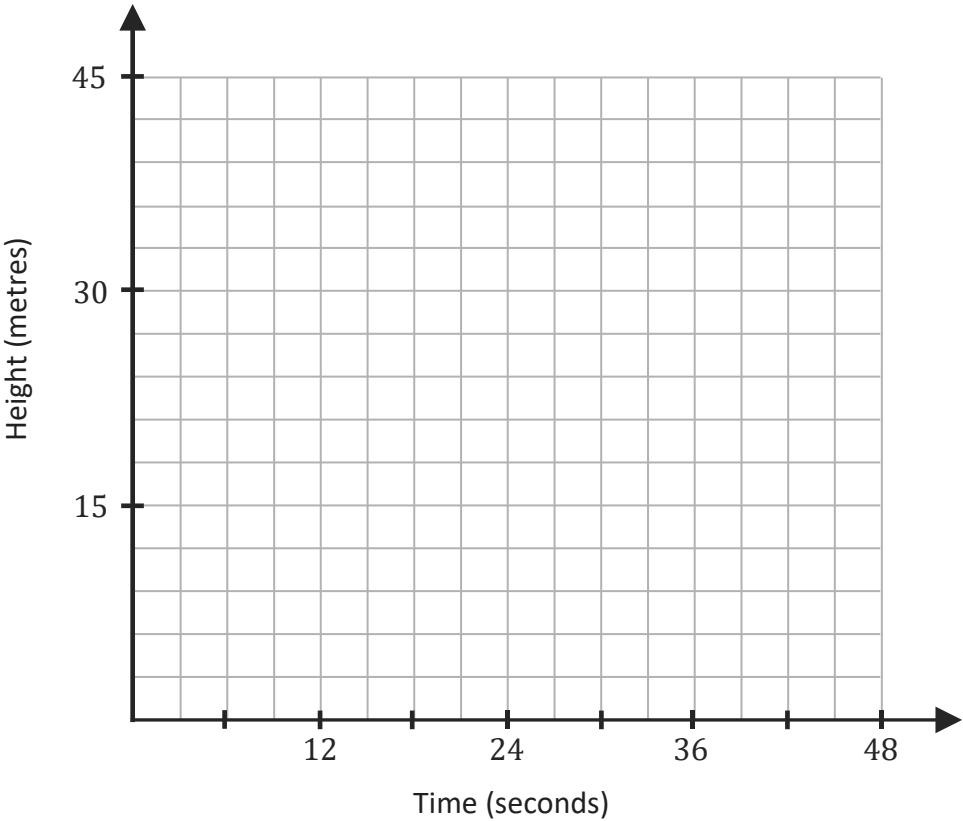
- (b) (i) Complete the table below to show the height of Katelyn’s carriage above ground level, for the time period shown.

Remember that $\left(\frac{\pi}{24}t\right)$ is expressed in radians.

$h(t) = 21 - 18\cos\left(\frac{\pi}{24}t\right)$					
Time (seconds)	0	12	24	36	48
Height of capsule (m)					

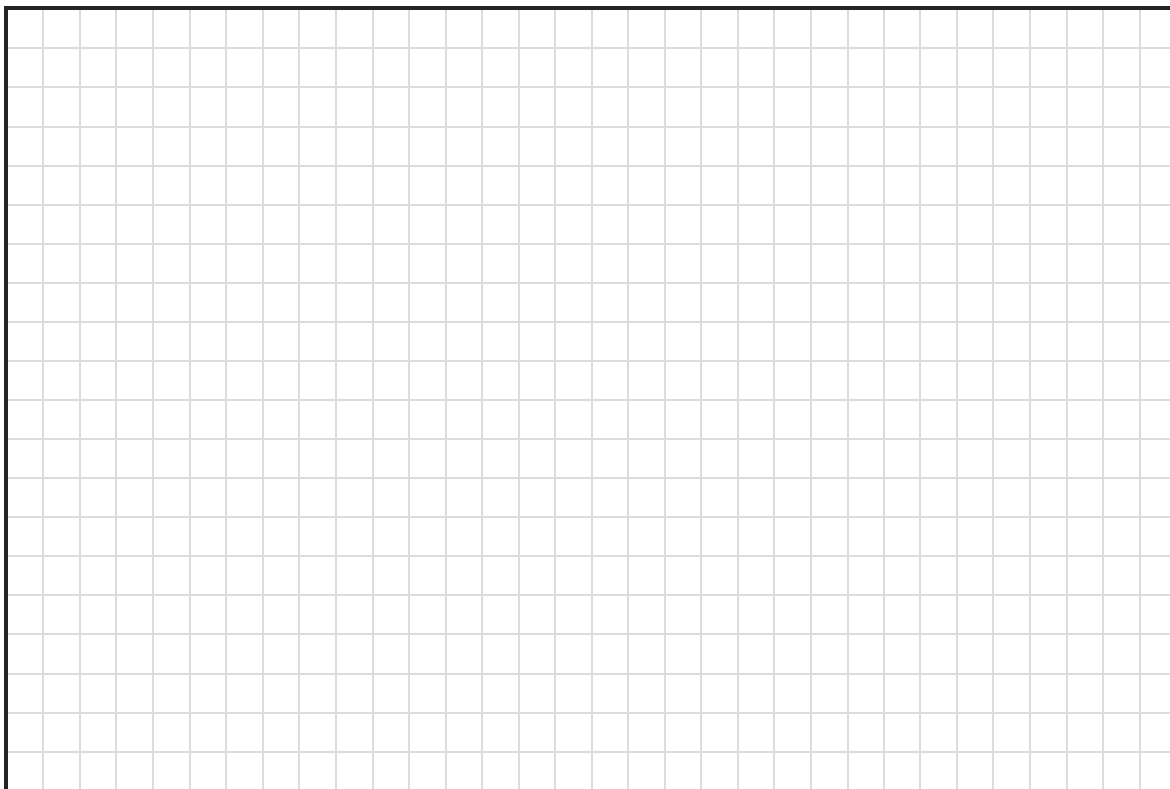


- (ii) Draw a graph to show the height of Katelyn’s carriage above ground level.

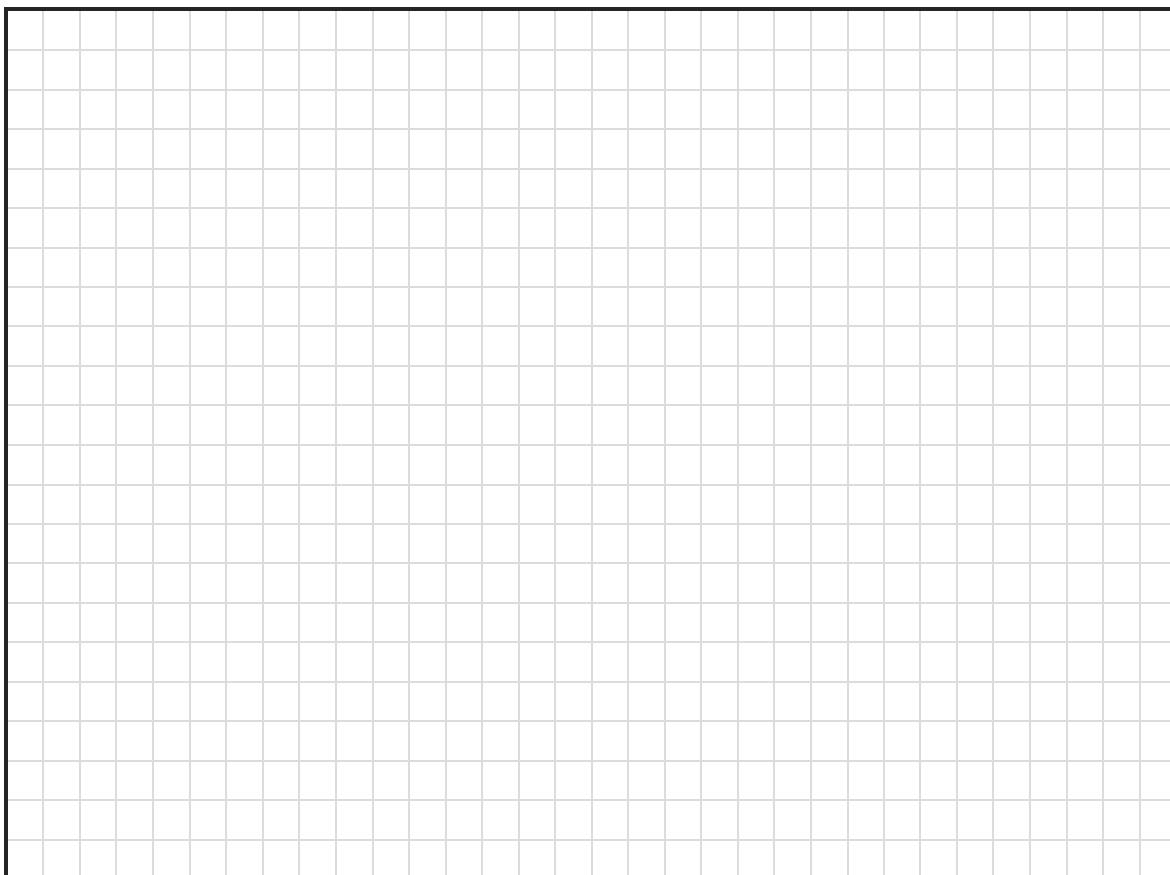


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- (c) Show, using calculus, that the average height of Katelyn's carriage on the wheel is 21 metres.

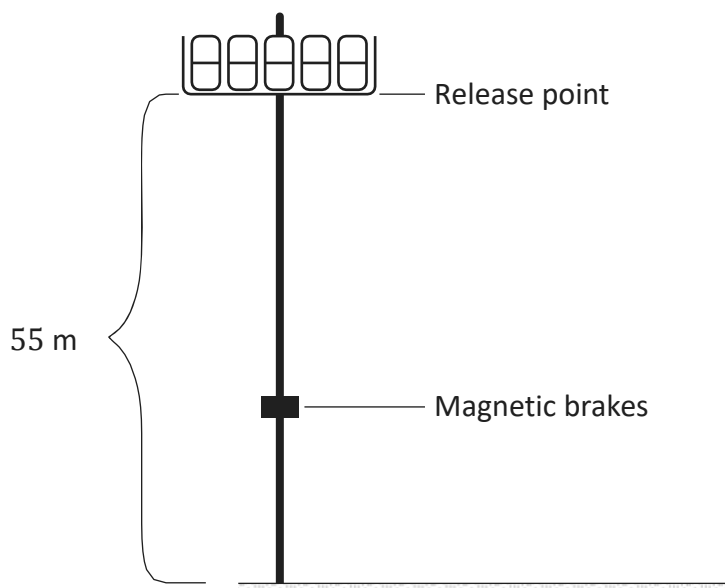


- (d) Find, by calculations, the **two** times, after the wheel starts turning, that the carriage is at a height of 15 metres above the ground.
Give your answer in seconds, correct to 1 decimal place.



- (e) Katelyn decides to go on another ride. A chair is released from a height of 55 metres and falls vertically.

Magnetic brakes are applied when the velocity of the chair reaches -27 metres per second.

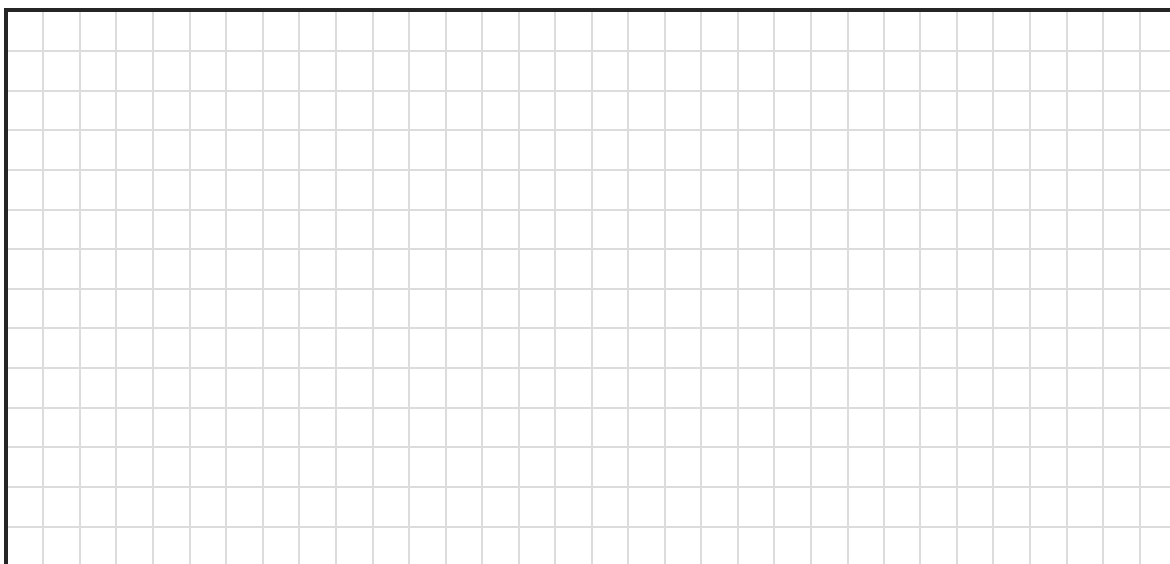


The height of the chair at time t seconds is x metres.

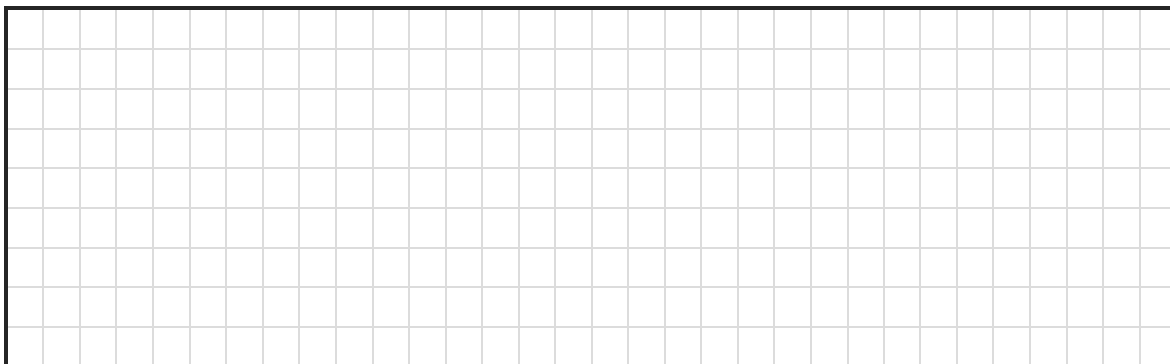
The acceleration of the chair is given by -10 metres per second per second.

At the release point, $t = 0$, $x = 55$ and $f'(t) = 0$.

- (i) Using calculus, show that $x = -5t^2 + 55$.

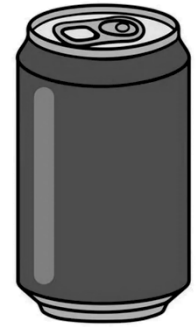


- (ii) How far has the chair fallen when the magnetic brakes are applied?



(50 marks)

The company sources empty cans from an external supplier, who claims that the mass of aluminium in each can is normally distributed with a mean of 15 grams and a standard deviation of 0.25 grams. A random sample of 64 empty cans was taken and the mean mass of the sample was found to be 14.92 grams.



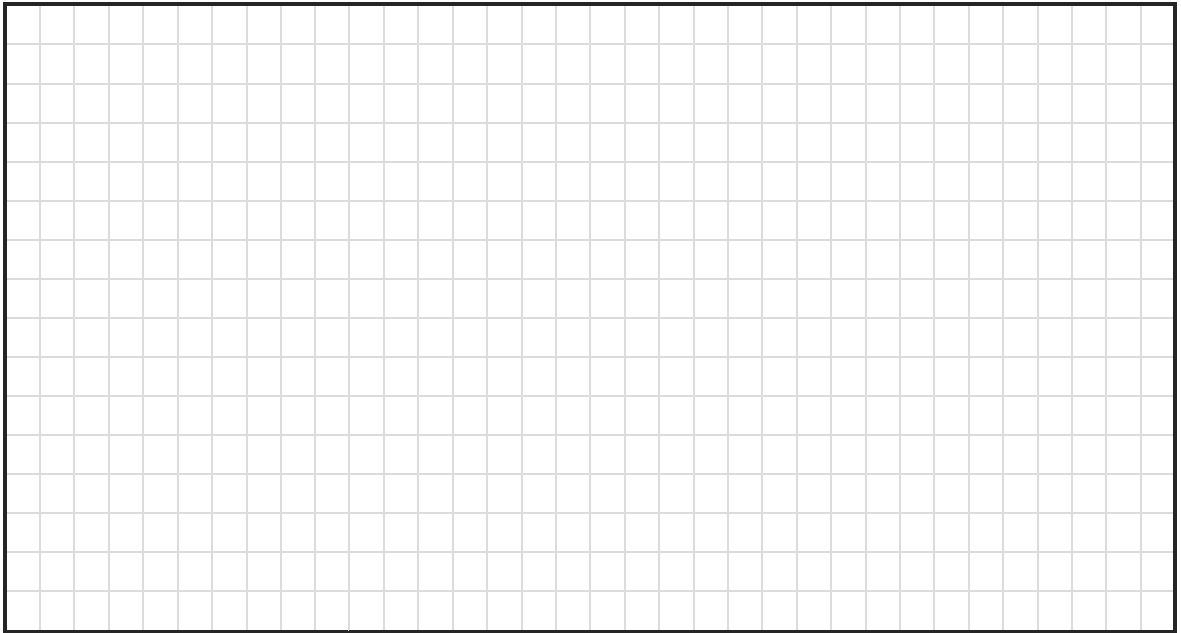
(a) (i) Write down suitable null hypothesis H_0 and alternative hypothesis H_1 for this test.

Null hypothesis, H_0 :

Alternative hypothesis, H_1 :

[illegible][illegible]

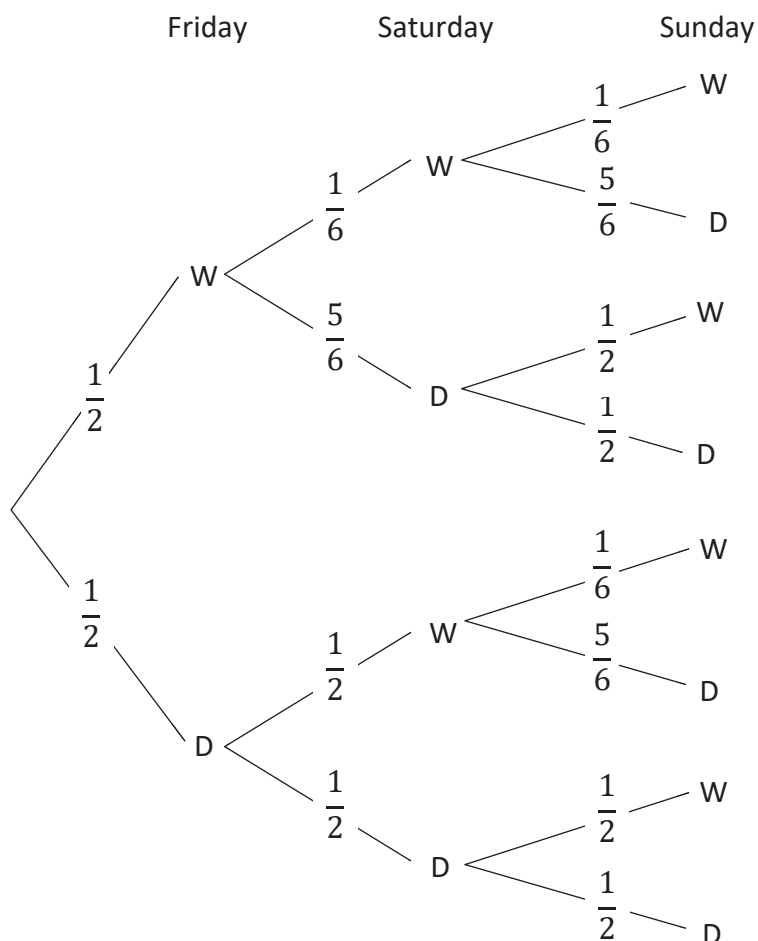
- (iv) Hence, calculate the p -value based on this test statistic and state the conclusion of the hypothesis test.



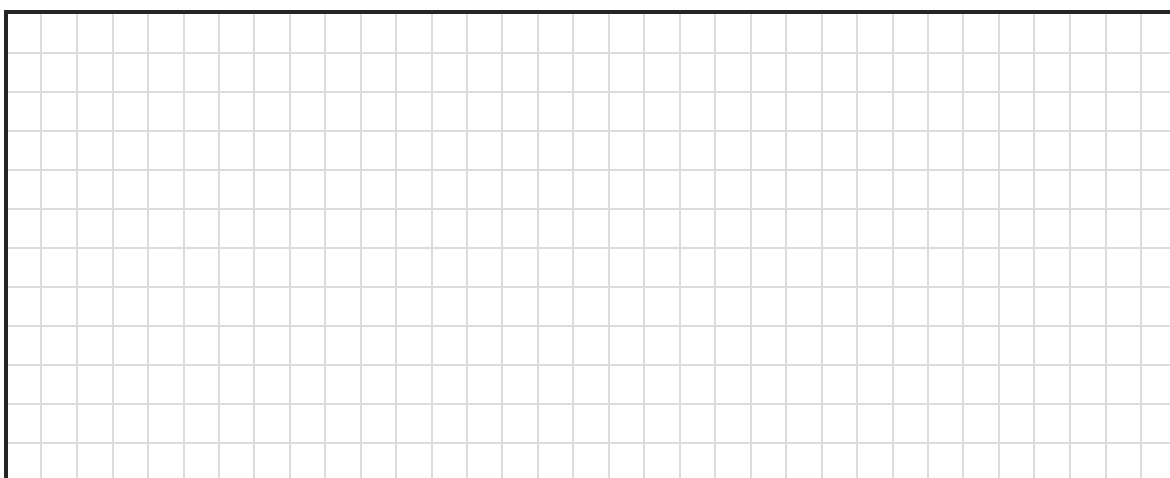
(b) Weather records for a town suggest that:

- if a particular day is wet (W), the probability of the next day being dry is $\frac{5}{6}$.
- if a particular day is dry (D), the probability of the next day being dry is $\frac{1}{2}$.

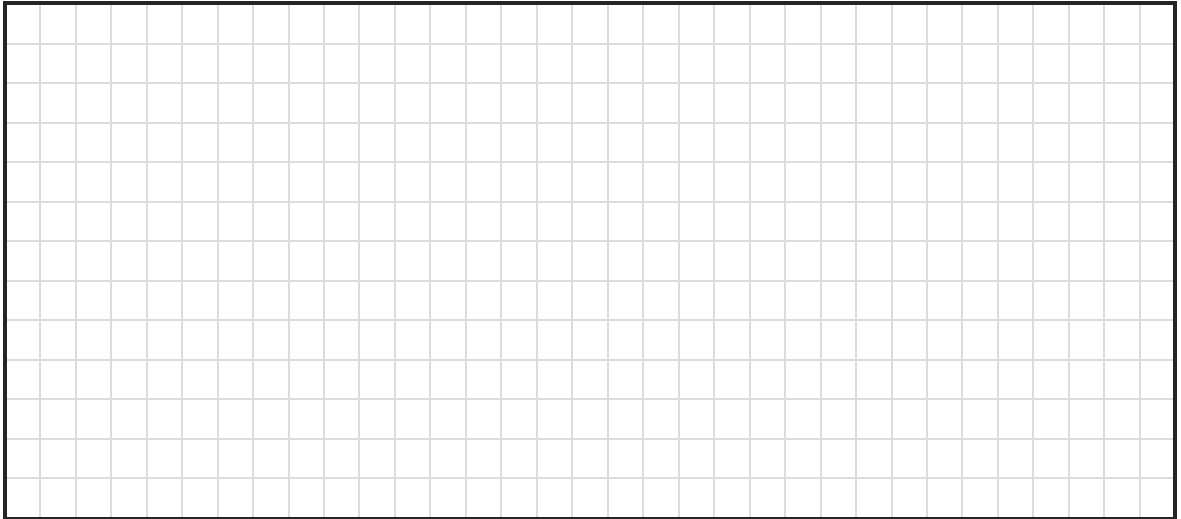
In a specific week, Thursday is dry. The tree diagram shows the possible outcomes for the next three days: Friday, Saturday and Sunday.



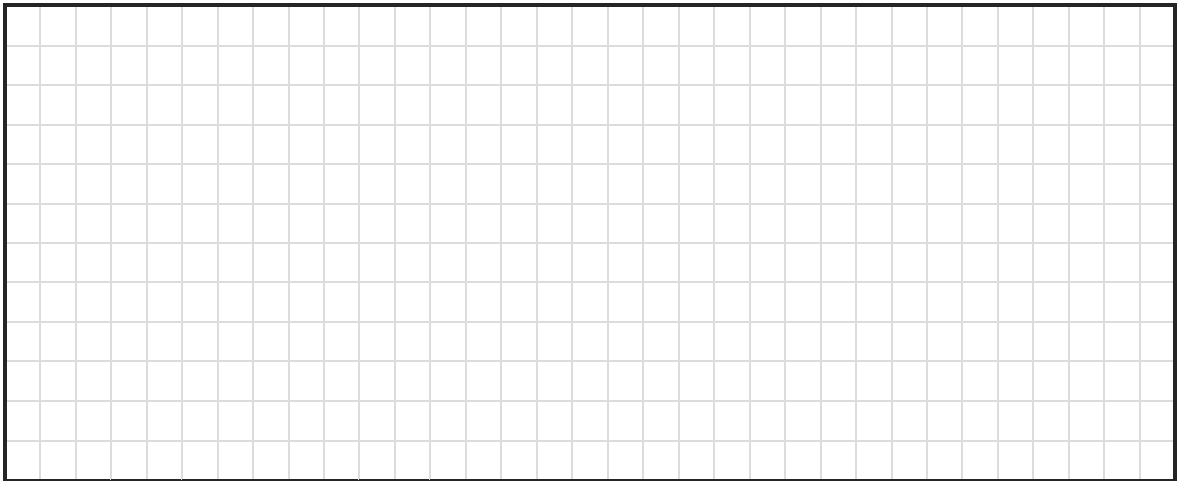
(i) Show that the probability of Saturday being dry is $\frac{2}{3}$.



(ii) What is the probability of both Saturday and Sunday being wet?

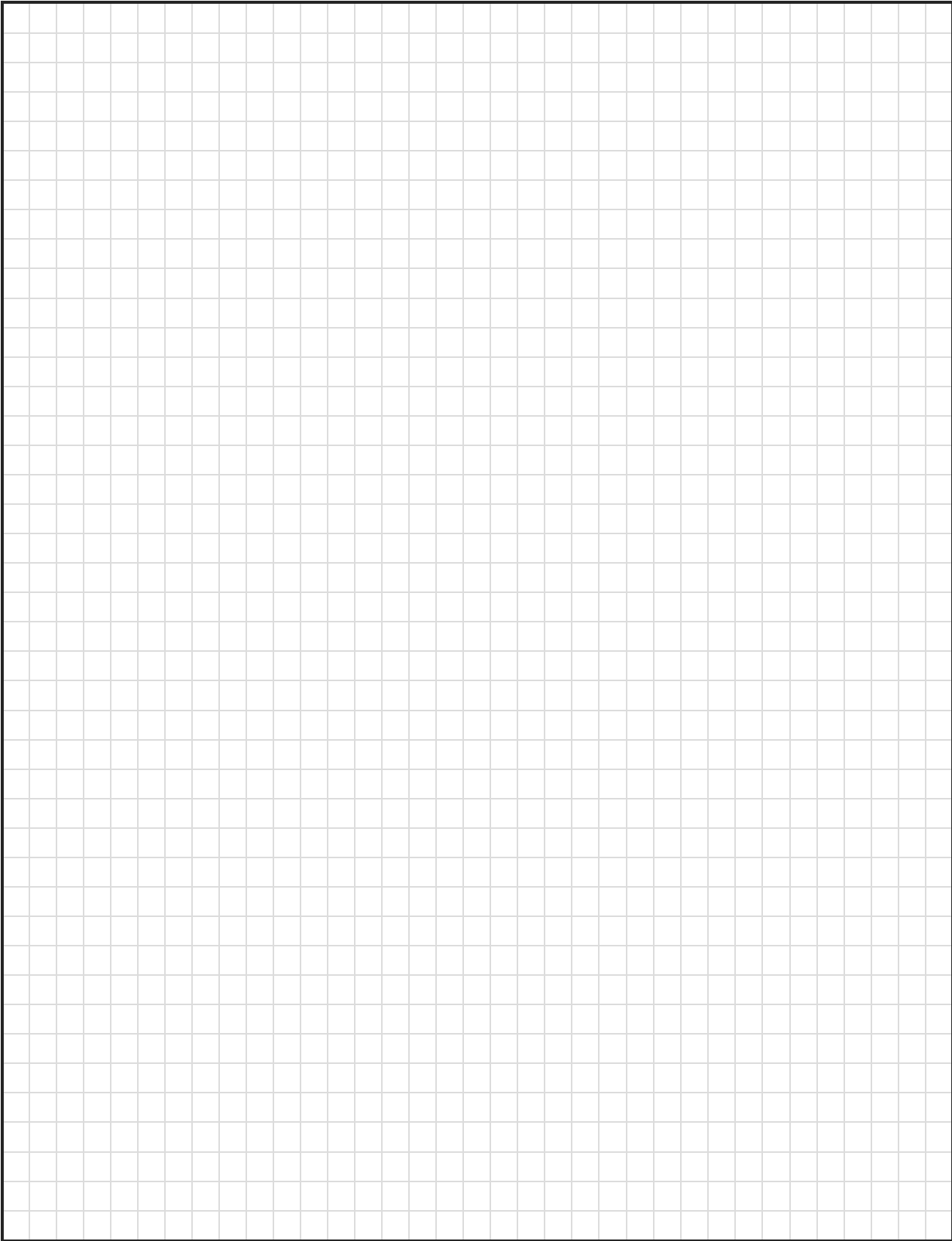
A large empty grid for drawing a probability tree diagram. The grid is 20 squares wide and 20 squares high, providing a space for students to draw their probability tree for the event of both Saturday and Sunday being wet.

(iii) What is the probability of at least one of Saturday and Sunday being dry?

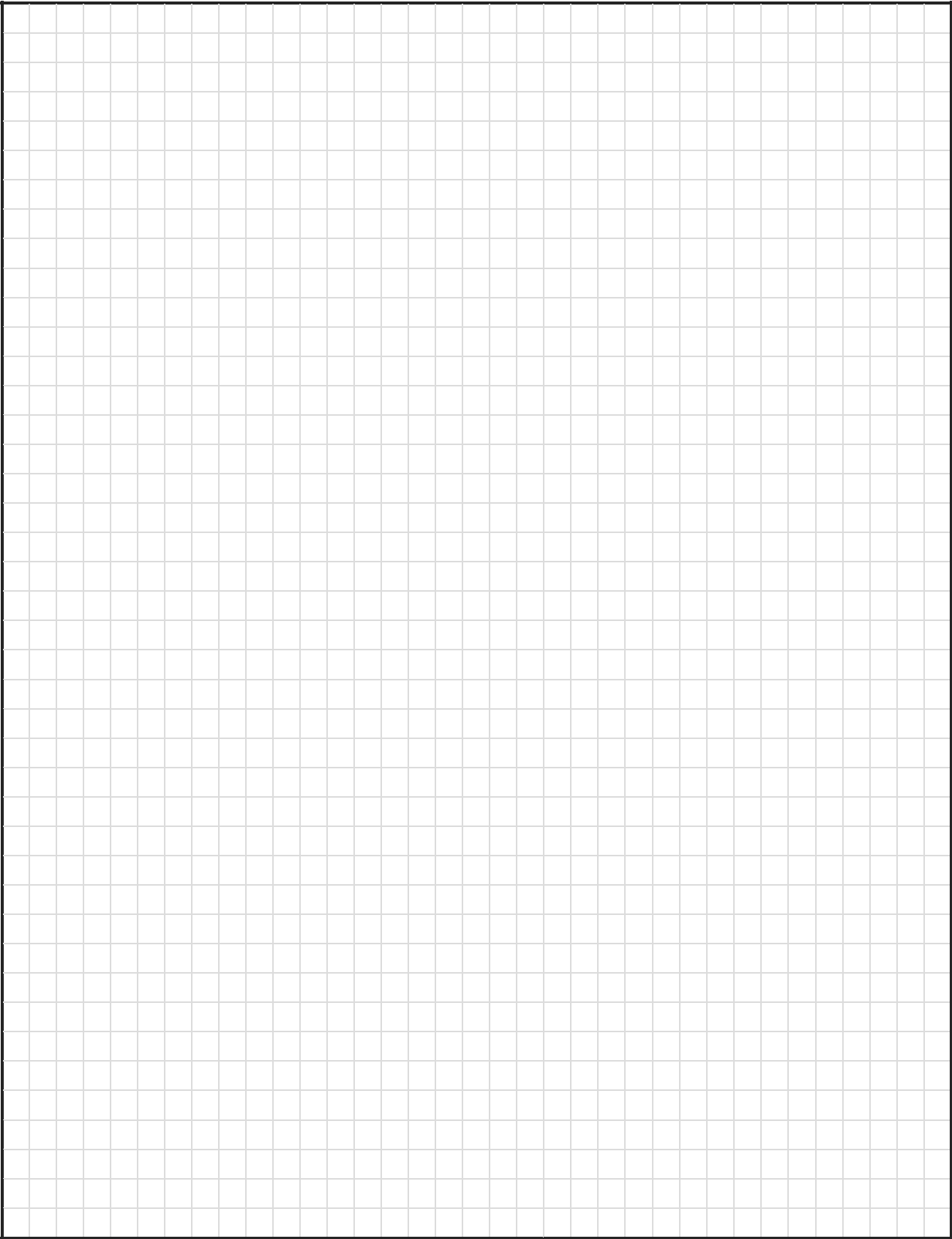
A large empty grid for drawing a probability tree diagram. The grid is 20 squares wide and 20 squares high, providing a space for students to draw their probability tree for the event of at least one of Saturday and Sunday being dry.

Page for extra work.

Label any extra work clearly with the question number and part.



Page for extra work.
Label any extra work clearly with the question number and part.



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